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Interrelationship of visual perceptual deficits, self-concept, and reading achievement

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THE INTERRELATIONSHIP OF VISUAL PERCEPTUAL DEFICITS, SELF-CONCEPT, AND READING ACHIEVEMENT

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CHAPTER I INTRODUCTION

The history of prescriptive education has been marked with conflicting views as to the effects of visual-perceptual training on reading achievement. As recent as the late sixties this debate took on a new dimension when studies began finding a correlation between visual-perceptual deficits and an unhealthy self-concept.

This research was undertaken as an attempt to sort out the myriad of studies, often apparently with conflicting results, dealing with the interrelationship of visual-perceptual deficits, self-concept, and reading achievement. The author has attempted to present an exhaustive and thorough summary of studies dealing with the aforementioned interrelationships. In a topic as broad and complex as the one being dealt with in this research, many more specific issues have presented themselves. Hence in an attempt to deal somewhat systematically with the topic, answers to the following questions have been attempted:

1) What have the studies shown concerning the relationship between visual-perceptual training and reading achievement?

2) What areas of reading achievement are most affected by visual perceptual deficits and training?

3) Has chronological age been a significant factor in the studies dealing with visual-perceptual training and reading achievement?

4) Have studies been affected by the definition of visual perception used in each particular study?

5) Have the studies presented been accepted as scientifically significant in their results and valid in that they measured what they have purported to measure?

6) What is the relationship between visual-perceptual deficits and training, and self-concept?

7) Has self-concept in itself as a variable affected reading achievement in past research?

Because of the nature and complexity of the subject material, the author was not able to deal with the questions as they stand systematically. Rather an attempt has been made to present the research systematically into four basic areas:

1) Visual perception and reading--what recent research says.

2) Beyond visual perception--the cognitive developmental approach.

3) Self-concept and visual perception.

4) Visual-perceptual training and its effect on the impulsivity factor in children.

The first two sections of research have attempted to deal with the issues of definition, statistics, validity and significance of the studies which have been done concerning visual perception and its effect on reading achievement. These two sections reflect the areas where the majority of research has been done and hence encompass the major composition of this research. The last two sections pertain specifically to psycho-emotional factors as they have been studied in relation to visual-perceptual deficits and training. While these areas have not been studied a great deal this

author has felt that the initial results are sufficiently worthwhile to have presented them in this report on research concerning visual-perceptual deficits.

Because of the tremendous amount of research done in this area, the author had to restrict this study to approximately the last five years of findings. Since much research had been done to build on previous research, it is this author's opinion that the findings of this study are representative of the cumulative work in this area. Occasionally a study has been mentioned which dates previous to the five-year limit because of its importance to the issues involved.

Finally, professionals have been unable to agree upon a set definition of what visual perception is. It has been found throughout the field that many studies have not defined what has been meant by visual perception and the related deficits. Other studies cited in this research give conflicting definitions or have added aspects not commonly included in the definition of visual perception. This study has chosen a working definition which has come closest to mutual agreement. For purposes of this paper, unless it has been otherwise stated, visual-perceptual processes have been defined as, "Those brain operations which involve interpreting and organizing the physical elements of the stimulus rather than the symbolic aspects of the stimulus and are usually referred to as visual discrimination and spatial relationships. Visual-perceptual tasks can, therefore, be differentiated readily from lower and higher order visual processing tasks, for example visual accuity and reading."[1] "In practice almost all assessment devices adhere to this

[1]Donald Hammill, Libby Goodman, and J. Lee Wiederholt, "Visual-Motor Processes: Can We Train Them?", Reading Teacher 27 (Fall 74): 470.

definition--Frostig's Developmental Test of Visual Perception, Bender's Visual-Motor Gestald Test, Graham-Kendall's Memory for Design Test, the Beery, and selected subtests form the Weschler and the Illinois Test of Psycholinguistic Abilities."[2]

Summary

Research dealing with visual perception has shown conflicting results. This study was undertaken to sort out the myriad of studies dealing with visual perception and its effects on reading achievement and self-concept. Because of the vast amount of research done in this area, this study has been limited to a review of research presented in the last five years. For the purposes of a systematic presentation of the findings, the material has been presented in four basic sections:

1) Visual perception and reading--what recent research says.

2) Beyond visual perception--the cognitive developmental approach.

3) Self-concept and visual perception.

4) Visual-perceptual training and its effect on the impulsivity factor in children.

Finally, while professionals have had conflicting ideation concerning the definition of visual perception, a working definition was selected and presented. The review of literature presented in the following chapter has adhered to this definition unless otherwise stated.

[2]Donald Hammill, Libby Goodman, and J. Lee Wiederholt, "Visual-Motor Processes: Can We Train Them?", Reading Teacher 27 (Fall 74): 470.

CHAPTER 2 REVIEW OF LITERATURE

Visual Perception and Reading-- What Recent Research Says

This first section of the review of literature has developed as the main part of this study because most research in the area of visual-perceptual strengths and deficits has been concerned with their effect on reading and academic achievement. Prior to submitting for analysis a summary of studies in this section, this author believed it necessary to add additional comments concerning definitions. While a working definition has been espoused in the introduction to this study, additional attempts at pointing out the complexity of visual perception are needed at some point. While the majority of authors have held to the definition previously purported, some of the studies will take on different dimensions and abilities not accounted for in the stated definition. Concerned with an attempt to sort out the myriad of aspects pertaining to visual perception, one professional stated, "Discussions relating to visual perception are made difficult by the variety of the definitions of the term 'perception' which are currently being used by professionals in the field...thirty-three have been located by Hammill in current literature."[3]

This author then has seen one of the initial conflicts in the field of visual perception as disagreement over what to include in the definition itself, and also what is measured by tests of visual perception. One example of the many disagreements concerning what a test measures and how accurate a

[3]Donald Hammill, Libby Goodman, and J. Lee Wiederholt, "Visual-Motor Processes: Can We Train Them?", Reading Teacher 27 (Fall 74): 470.

working definition is has been studies done to determine the diagnostic value of the Frostig Developmental Test of Visual Perception. Frostig developed this test to measure five areas of visual-perceptual functioning. These include eye-hand coordination, figure ground, form constancy, position in space, and spatial relationships. In the past five years, however, many studies of the Frostig approach have been published and conclude two separate findings, both of which disagree with initial data presented by Frostig at the initial stages of her test and program. Representative studies of the two resulting opinions are presented below.

A study by Hammill et al is representative of one group of studies done in this area. Hammill et al state, "The Frostig training approach presumes that the subtests do, in fact, measure discrete areas of visual perception. The purpose of the present study was to determine whether the DTVP subtests are indeed independent enough to justify such a differential training approach. For this purpose the DTVP was factor-analyzed with a random sample of kindergarten and first-grade youngsters. In addition, the performance of subjects diagnosed as having visual perception problems was analyzed."[4]

The procedures of the Hammill factor-analytic study used a sample of 86 kindergarten and 80 first-grade pupils. A table of random numbers had been employed to select the 166 subjects from 520 pupils in 18 classes in three schools. The measures used in the study were the DTVP and the Slossen Intelligence Test. Three factor analyses were performed: No. 1 included DTVP subtests, C.A. and M.A. were included as variables; No. 2 only the DTVP subtests

[4]Donald Hammill, Ron P. Colarusso, and J. Lee Wiederholt, "Diagnostic Value of the Frostig Test: A Factor Analytic Approach," The Journal of Special Education 4 (number 3): 279.

were included; and No. 3 the performance of 57 perceptually handicapped subjects was analyzed using the DTVP subtests as variables. The results of the three factor analyses showed that, "Of the three analyses, two (No. 2 and No. 3) yielded only one factor. The single factor, Visual Perception, accounted for 53% of the variance in the first instance and 49% in the second."[5] No. 1 analysis yielded two factors--a general maturity factor and visual perception.

Hammill et al continue in the discussion section of their report to state:

> These results agree substantially with those of other researchers who have concluded that the DTVP measures one general visual perception factor, rather than the five postulated by Frostig...The DTVP subtests do not lend themselves to independent interpretation and cannot be used as the basis for formulation individual remedial programs for children with specific difficulties in visual perception.[6]

A final note which should be included is that, although separate subtests have been demonstrated as yielding only one factor, Hammill has demonstrated the high reliability of the tests total score and P.Q. It is suggested, therefore, that the identification of children in need of special perceptual training could be predicted on this value.

A similar study by Becher and Sabatino attempted to determine, among other things, the principal components that emerge when correlation data are treated factorially. The subjects were 154 children from all eight kindergarten classes in the district. The chronological age range was from

[5]Donald Hammill, Ron P. Colarusso, and J. Lee Wiederholt, "Diagnostic Value of the Frostig Test: A Factor Analytic Approach," The Journal of Special Education 4 (number 3): 280.

[6]Ibid., p. 281.

5-3 to 6-11."[7] Administered were the DTVP and the Bender Visual-Motor Gestalt Test. Factor analysis was done orthogonally. Results indicated that:

> The five DTVP subtests do not measure five different and relatively independent perceptual abilities. However, the data reported in this investigation failed to support the contention that the DTVP measures a common perceptual function. The orthogonally rotated variables for the present sample disclosed three factors: visual-motor skills, figure-ground perception, and visual discrimination skills...
>
> The results of this analysis of the specific correlates of the three selected visual perceptual tests not only support the presence of more than one general visual perceptual ability, but they also point out the complexity of visual perception itself.[8]

It has been ascertained by this author that these two conflicting factor analytical studies are representative of two sets of results as found in research concerning factor analysis of the DTVP. Two studies have been published recently dealing with the effect of method of measurement on resulting factor analytical loadings. Both studies have shown that the method of measurement greatly affects resulting factorial loadings, thereby leaving unresolved the question as to whether there is one, three, or five factors in the DTVP.

The first study dealing with the effects of measurement on outcome factor loadings was done by Ritter and Sabatino. They stated the effects of methods of measurement upon task performance on nonexceptional children (to rule out contamination of results due to subjects). "The sample consisted of 64 first-grade children of average or above average intelligence

[7]John T. Becker, and David A. Sabatino, "Frostig Revisited," Journal of Learning Disabilities 6 (number 3): 181.

[8]Ibid., p. 183.

who did not present evidence of brain injury or visual perceptual dysfunction. Chronological age ranged from 6.0-7.9 years."[9] Each child was individually administered a series of eight basic tasks of visual figure-ground perception and form discrimination. The hypothesis being that although the tasks purported to measure two and only two unique aspects of visual perception, different modes of measuring would produce different statistics which would significantly alter the research. The authors' conclusion to their study stated:

> The study indicated that, even on the most basic tasks, performance fluctuated with alteration in the method of measuring the task...The implication for the researcher is that two separate tests might correlate highly because the same method of measurement was used and not because the same trait was involved. Lastly, support is generated for the previous hypothesis of visual figure-ground perception and form discrimination being essentially the same.[10]

The other study concerned with differences in method of measurement was more directly related to this research concerning visual-perceptual abilities and reading achievement. The authors saw that how one measures visual perception or what are the defining criteria has made an affect on results in the studies of visual-perceptual deficits. In the introduction to their study, Crary and Ridgway stated:

> Various professionals have established that form perception is positively correlated with reading performance. However, there is uncertainty as to the most useful way to estimate form perception ability and to how related is this aspect of perception to performance on measures of reading ability. Differences in the type of responses used to define a percept may produce different results in experimental studies. Perceptions as measured by a test of visual discrimination

[9]David R. Ritter and David Sabatino, "The Effects of Method of Measurement Upon Children's Performance on Visual Perceptual Tasks," Journal of School Psychology 12 (number 4, 1974): 297.

[10]Ibid., p. 304.

may relate differently to reading ability than perception as measured by an instrument requiring a visual-motor response. Since the literature does not directly contain results of studies which investigate this matter, the present investigation was undertaken.[11]

The authors have seen two trends followed by experts who have studied form perception (which has been sometimes spoken of as synonomous with visual perception and at other times not). In their efforts to relate form perception abilities to reading achievement investigators generally have used visual-form-discrimination ability or visual-motor ability as the measure of form perception. For the purposes of this investigation the authors have defined form perception very similar to the definition of visual perception espoused for this research. "Visual form perception is defined as that process by which phenomena are apprehended through the eye and a response is effected by the mind."[12] The investigation then was undertaken to determine by which type of test, visual discrimination or visual-motor, a child's measured perceptual ability is more closely related to his reading ability. A total of 165 fourth, fifth, and sixth-grade students participated in the study. I.Q. was found after grouping students to be non-significant. In all, five tests were used to measure visual-form perception ability. The tests were related to the three aspects of visual perception being studied, i.e., perceptual speed, (Primary Mental Abilities Perceptual Speed Test); visual motor, (Bender Visual-Motor Gestalt Test); visual-motor memory, (Benton Revised Visual Retention Test - forms C and D, Weschler Memory Scale, and

[11]Helen Crary and Robert W. Ridgeway, "Relationships Between Visual Form Perception Abilities and Reading Achievement in the Intermediate Grades," The Journal of Experimental Education 40 (number 1, Fall 71): 17.

[12]Ibid., p. 17.

Memory for Designs Test). Tests of reading achievement were the Iowa Silent Reading Test and the California Reading Test.

The results of this study were computed using the Hotelling t. They are:

> The original hypothesis was that visual discrimination ability is more highly correlated with reading ability than is visual motor ability. Thus a positive value of Hotelling's t supports the hypothesis while a negative value negates it. Of the 20 values calculated for each grade, all were positive for grades four and six, and 18 were positive for grade five, thereby showing visual discrimination as having the higher correlation with reading achievement.[13]

A few comments must be made concerning the definitional studies of visual perception cited above prior to the discussion of research affirming and denying the correlation between visual-perceptual deficits and reading achievement. First, it has been this author's experience that there has existed little research in the area of the effects of measurement and definition on studies of visual perception. The two reported above are the summation of what has been published in the last five years. They are valid only at the age level studied, which has been found interesting because of the increasing amount of research which has purported visual-perceptual deficits having different affects on reading achievement at different eye levels.

Secondly, while there is a proliferation of research concerned with factor analysis of tests of visual perception (particularly the DTVP), little conclusively can be stated, except that research has resulted in the espousal of three conflicting results. Frostig herself tests five separate aspects

[13]Helen Crary and Robert W. Ridgeway, "Relationships Between Visual Form Perception Abilities and Reading Achievement in the Intermediate Grades," The Journal of Experimental Education 40 (number 1, Fall 71): 20.

of visual perception while other researchers in the field have seen either one or three discernible aspects in the DTVP. For the study presently reported, this has added the aspect of inconclusiveness to what has been researched in the other areas of this study. In other words, there have not been decisive conclusions as to how best to measure different aspects of visual perception or how best to define it. All that can be said is that studies have shown that different measure and definitions have affected the results of research.

Research Affirming a Correlation Between Visual Perceptual Abilities and Reading Achievement

In the past five years many studies have been undertaken to prove or disprove the correlation between visual-perceptual abilities and reading achievement. Prior to reporting the results of this study into this area it was necessary to remove those studies which had not checked for contamination by sex, I.Q., socio-economic class, or other variables. After this procedure it was found that there had been published in the last five years or so twenty-two pieces of research dealing with the effects of visual perceptual deficits and reading achievement. Of these, eight had found a significant correlation, while fourteen had not. Following is a review of those which had affirmed a positive correlation.

One article sought to prove a physiological basis for a correlation with learning problems. The study sought to find out if there was a significant correlation between muscular imbalance (lateral phoria) and learning problems. They stated that, 'While it is not suggested that phoria conditions cause

severe reading and other types of learning disabilities, the presence of such a condition could contribute to the many visual-perceptual abnormalities noted among these children."[14]

The study was a strictly statistical analysis of the incidence of lateral phoria in a public school control group compared to the SLD population of that same public school population. "11.3% in the public school control group gave test responses indicative of the presence of lateral phoria, as compared to 22% of the SLD children. This difference is statistically significant, chi square = 5.47, $p < .02$. These results suggest a high incidence of lateral phoria conditions among SLD children."[15]

While this study was restricted to a set population and is the only one done on physiological visual-perceptual deficits as related to academic achievement in the past five years, this author felt it worthy of being mentioned in this review of literature. To be sure, its results should point to a need for further studies in this area.

Other studies have dealt with aspects of visual perception. One studied the effects of visual memory on reading achievement. Some professionals have seen visual memory as a part of visual perception; therefore, this research has been included. The authors state that:

> Because of the general concern regarding the role of visual memory in associated learning, as well as the more specific concern regarding plausible visual memory deficits of poor readers, this study was undertaken. Three hypotheses were tested. The first hypothesis was that on a paired-associate learning task children with high scores on visual recognition memory test would be superior to children with low scores.

[14]James Evans, Marvin Elfron, and Clare Hodge, "Incidence of Lateral Phoria Among SLD Children," Academic Therapy 11 (number 4, Summer 76): 431.

[15]Ibid., p. 432.

> The second hypothesis was that good readers would be superior to poor readers in visual recognition memory. The third hypothesis was that there would be a difference between good and poor readers in the kinds of errors made on a visual memory task.[16]

The plan of this study was rather straightforward. Subjects were given tests of visual memory using stimuli which were similar, but not identical, to those used in a subsequent paired-associate learning task. Scores on the visual-memory and the paired-associate tasks were then used for analysis. The subjects, 64 second grade students, also had previously taken the California Test of Mental Maturity and the California Achievement Test to check for contamination of results due to I.Q. and to check achievement as a variable of visual memory. The results stated that:

> The relationship between I.Q. and visual recognition memory is not significant. Thus, in this study visual recognition memory can be considered to be independent of I.Q. Correlations holding I.Q. constant were calculated between visual recognition memory and measures of paired-associate learning and reading achievement. Visual memory was not found to be significantly related on the easy paired-associate task but was significantly related in the hard task ($p < .01$). Visual memory was significantly correlated with vocabulary scores ($p < .05$)...The analysis of variance also indicated the main affect of visual memory was significant: that is, those with superior visual memory were superior in paired-associate learning. We found no difference in paired-associate performance associated with I.Q. levels, nor was the interaction of I.Q. and visual memory significant.[17]

The research indicates that I.Q. is not a factor in paired-associate learning (an important reading skill), but that strategies of attention are trainable. This study, according to the authors, "has important implications for reducing the visual memory and perceptual learning deficits of poor readers."[18]

[16] S. Jay Samuels and Roger H. Anderson, "Visual Recognition Memory, Paired Associate Learning, and Reading Achievement," Journal of Educational Psychology 65 (number 2, 1973): 160

[17] Ibid., pp. 162-163. [18] Ibid., p. 166.

In a similar study, Hallwell and Solan studied the effectiveness of an extended comprehensive, supplementary perceptual and perceptual-motor training program on the reading achievement of first-grade boys and girls who were designated as potential reading problems. The authors addressed themselves to the apparent conflicting studies regarding perceptual training. Reviewing previous studies and research, they saw that those programs which were effective were programs which used perceptual training as a kindergarten addition prior to the regular reading program in the first grade, rather than those programs which used perceptual training either as a total approach or as a partial approach in the regular first-grade reading program. They sought then to find out if the grade variable from kindergarten to first grade produced such a significant result.

Hallwell and Solan also sought to purify their study of other questions which have been pondered concerning previous studies of visual-perceptual training. They state:

> Supporters of perceptual training have justifiably argues that most of the studies employing the various types of perceptual training were conducted for a short duration and with small samples, thereby tending to militate against obtaining significant results. Some advocates of perceptual training would further argue that such programs were often carried out with total student samples rather than with poor readers or students with measurable perceptual deficits and under the direction of teachers who received inadequate training in perceptual techniques.[19]

Using trained directors then to administer the visual-perceptual programs, the authors used a thorough program. All of the entering first-grade students in a large suburban school district were administered the Metropolitan Reading Test. A group of 105 students who were considered most likely to encounter

[19]Joseph W. Hallwell and Harold A. Solan, "The Effects of a Supplemental Training Program on Reading Achievement," Exceptional Children 38 (April 1972): 616.

reading difficulty was placed in the program. These students were randomly assigned to one of three groups: control group, experimental I group, and experimental II group.

> The control group was composed of 35 students who were distributed throughout the school system and were to participate in the regular reading program conducted by first-grade teachers.
>
> The experimental I group was also composed of 35 students who were distributed throughout the school system and were to participate in the regular reading program conducted by the first-grade teachers. In addition, they were to be recipients of perceptual and perceptual-motor training conducted by reading personnel who had been trained in such techniques for six weeks prior. The perceptual training sessions for the students were of 45 minutes duration and were scheduled twice a week from November 1 - May 20th.
>
> The experimental II group was also composed of 35 students who were distributed throughout the school system and were in the regular first-grade reading. In addition to regular classroom instruction, they were to be the recipients of special reading assistance conducted by the same reading personnel who worked with the experimental I group.[20]

The students in all three groups were administered the Metropolitan Achievement Test at the end of May. The criterion of effectiveness was to be the Metropolitan. Analysis of the data indicated that the experimental I group (perceptual training) obtained the highest mean scores in each of the sex groups. Furthermore, "Analysis of data indicated that the only significant differences favored the experimental I group over the total group. Although experimental I group obtained higher scores than did experimental II group, they were not significant."[21]

The authors point out the success of their perceptually trained group in comparison to other studies. They cite three factors as plausible

[20]Joseph W. Hallwell and Harold A. Solan, "The Effects of a Supplemental Training Program on Reading Achievement," Exceptional Children 38 (April 1972). 616-617.

[21]Ibid., pp. 617-618.

rationale for the success of their program; those are trained personnel managing the visual-perceptual training, length of training program, and use of only potential problem readers as subjects. If indeed then results reported above are correct, a basic question needs to be answered with the use of perceptual training for improvement of reading achievement, i.e., which students should be the recipients of such training? On the basis of research currently existent, it would appear that perceptual training is better for students with low-readiness scores. Of course, more research is warranted.

A similar study which sought rationale for the conflict in research was done by Spring. He states that those studies which have found insignificant correlations have "used error-frequency as a measure of perceptual performance. The research reported here, however, focuses on perceptual speed. The hypothesis tested was that children who are poor readers process visually presented letters slower than normal readers matched on age, I.Q., and sex."[22]

The method was to present two letters simultaneously, and subjects were to press one button if the stimuli were similar and another if they were different. Subjects were told to respond as quickly as possible while minimizing errors. Reaction time and error data were recorded. Two groups of children matched on age, sex, and I.Q. participated. The children were of ages 8-11. The group designated as problem readers were at least 2.5 years below reading level. Reading ability grade level was determined from the Stanford Achievement Test.

[22]Carl Spring, "Perceptual Speed in Poor Readers," Journal of Educational Psychology 62 (number 6, 1971): 492.

Results of the study state that:

> When dyslexic and normal groups were compared on total reaction time, the dyslexic group was slower than the normal group. But when dyslexic and normal groups were compared on central components of reaction time, the dyslexic group was slower than the normal group only during the second half of the test sessions. Thus central components of latency deteriorated during 10 minutes of intensive testing, while central components of latency for the average reader were unchanged.[23]

For understanding something of the nature of dyslexia, this study had shown that response time increased significantly after 10 minutes of intensive processing. Since most perceptual tasks are more than 10 minutes, it has been deemed plausible that decreased latency could be a factor in visual-perceptual deficits and/or reading disability. While two other studies were done in the early sixties and concluded with the same results, more research has been deemed necessary into the latency component of visual-perceptual deficits.

Another study by Shapiro et al sought to deduce the most efficient and reliable way to develop skills in potentially problem readers. They state:

> A number of investigators in the field assert that treatment of modality deficiencies such as auditory discrimination, visual perception and gross and fine motor skills is related to success. On the other hand, a considerable number stress direct remedial reading techniques. The purpose of this present study was to examine the relative effectiveness of three remediation techniques and a single control in terms of the language arts and arithmetic achievement of "high risk" first graders.[24]

The direct remediation technique consisted of the Distar Reading Method. The method concentrates on basic word attack skills. The indirect method

[23]Carl Spring, "Perceptual Speed in Poor Readers," Journal of Educational Psychology 62 (number 6, 1971): 496-497.

[24]Blanche L. Serwer, Bernard J. Shapiro, and Phyllis P. Shapiro, "The Comparative Effectiveness of Four Methods of Instruction on the Achievement of Children with Specific Learning Disabilities," The Journal of Special Education 7 (number 3, 1973): 241.

was given by a specialist in visual-perceptual training who combined her methods with those of Kephart and others. In the combined method time was divided equally between the Distar method and perceptual training. The control group received no special remediation. The sample was three hundred in six kindergarten classes. After a three-stage screening procedure, consisting of teacher evaluation, a battery of intelligence and achievement tests, and differences between potential and achievement, sixty-two high-risk pupils were selected and randomly assigned to the four groups. The treatment period extended over the entire first-grade year, and treatment periods were for one-half hour each day or two and one-half hours each week.

The major question posed in this research relates to the relative effectiveness of the four methods used in learning disabilities. Effectiveness was assessed after approximately three and one-half months of instruction and after seven months with the final posttests. Differences in group scores were evaluated by an analysis of variance.

> Of the interim posttests, the Word Recognition and Letter Names Test, statistically significant differences were noted among the four groups on only the word recognition test. These differences consistently favored the indirect method, with the combined method always second, the direct method third, and the control group last.
>
> In final posttests on the Metropolitan Achievement Test, the arithmetic subtest scores showed a statistically significant difference at the .05 level, favoring the indirect method. The other three subtests appear to favor the indirect method also.
>
> In an analysis of the Gates-McKillop Total Oral Reading Test, no statistically significant differences were seen among the four methods, (again results tended to favor the indirect group).
>
> There were statistically significant differences between the four treatment groups of the Handwriting Scale. These differences favor the combined and indirect methods.[25]

[25]Blanche L. Serwer, Bernard J. Shapiro, and Phyllis P. Shapiro, "The Comparative Effectiveness of Four Methods of Instruction on the Achievement of Children With Specific Learning Disabilities," The Journal of Special Education 7 (number 3, 1973): 244-245.

The results in the math and handwriting posttests support the theoretical approach of Kephart, Frostig, Johnson and Myklebust that training in perceptual motor skills is effective at the age studied. Although some professionals have stated that Frostig would favor delaying the academic areas of reading and language skills to teach the processes, she has denied that. She states that "perception and language skills must be taught together; they are interdependent abilities."[26]

Finally, although statistical correlation was not significant for the process (indirect) group in reading achievement, strong support has been warranted by the direction the statistics are pointing toward further research with a larger group of subjects which may prove statistically significant.

Visual discrimination is said to be among the skills considered essential for proficiency in beginning reading. Some scholars see visual discrimination as synonomous with visual perception, while others view it as a lower ability. Those who view it as synonomous usually add to the definition beyond mere discrimination in that the percept has to be recalled from previous experience.

A study by Whisler has been chosen to be included in this research because the working definition of her study is visual perceptual in origin. She defines visual discrimination as:

> The ability to distinguish similarities and differences between stimuli to which repeated reference may be made, as in the direct matching of items...Visual discrimination tests are, in fact, tests that measure visual memory. The skill that develops as a result of either visual discrimination or visual memory is most commonly called visual discrimination. That is the name used in the study.[27]

[26]Marianne Frostig, "Visual Perception, Integrative Functions, and Academic Learning," Journal of Learning Disabilities 5 (number 1, January 1972): 17.

[27]Nancy G. Whisler, "Visual Memory Training in First Grade: Effects on Visual Discrimination and Reading Ability," The Elementary School Journal 75 (October 74): 51.

The results of visual discrimination training have yielded conflicting results the same as visual perception. According to many scholars, they may be synonomous, and methods of testing often call for the same skills. Whisler sees that most studies concerned with the effects of discrimination training on reading have been too short to produce valid results. It seemed justifiable to the author that, if more intensive and extensive practice in visual memory was provided in first grade, this practice would bring about more growth in visual discrimination and even higher levels of total reading achievement. This study "tested the null hypothesis that there is no significant difference in visual discrimination or total reading ability between first-grade pupils who take part in a program of visual-memory training and pupils who do not."[28]

A total of 295 pupils from twelve regular first-grade classrooms participated in the study. Six classes of 152 pupils were designated as the experimental group. In addition to the basal reader program, pupils in this group were given fifteen minutes of daily training in visual memory for fifteen weeks. The 143 pupils in the other classes made up the central group. Pupils in this group received only basal reader instruction. Pupils were grouped randomly, and correlational studies showed I.Q. and sex not to be significant factors. Pretest data was obtained from the McHugh-McPacland Reading Readiness Test. After completion of the program, the Durrell Visual Discrimination of Word Test was administered to assess growth in visual discrimination. The Stanford Achievement Test was used to assess total reading achievement.

[28] Nancy G. Whisler, "Visual Memory Training in First Grade: Effects on Visual Discrimination and Reading Ability," The Elementary School Journal 75 (October 74): 52-53.

The results showed that the experimental group had a significantly greater gain in visual discrimination. More important for this research is the transfer value to the reading task. The experimental group showed more growth in total reading ability than the control group. This group, which had the visual-memory practice, started with lower levels in reading readiness and scored higher than the control group on the posttest.

> The analysis of covariance revealed a significant difference ($p < .10$) in total reading ability in favor of the experimental group. Although this level of significance is definitely less stringent than some would want, the difference in reading gains between the two groups is too large to merely be attributed to incidental learning.
>
> Further, the analysis of covariance showed the difference in development of word recognition skills, as measured by the word reading subtest to be significant ($p < .01$), the difference favoring the experiment group.[29]

While Whisler's study is statistically accurate, it poses a problem because the treatment group received more instruction time in reading than the control group. Secondly, this study used children of a solely middle-class socio-economic background. When reviewing research which denies a correlation between visual-perceptual abilities and reading achievement, it was noticed that there is for some reason a propensity to use the lower socio-economic children as subjects. Whether this made a difference is left for future research. Finally, again this author must point out the definitional contrasts and similarities between this study and other visual-perceptual studies. By Whisler's definition, visual discrimination, memory, and perception are closely related and intertwined, if not the same process in fact.

[29]Nancy D. Whisler, "Visual Memory Training in First Grade. Effects on Visual Discrimination and Reading Ability," The Elementary School Journal 75 (October 74): 53.

In the same vein, a visual-perceptual training program that was federally funded was published just last year. The Coronado Program's rationale is based upon the interrelationship of perception, motor skill, and cognition. The authors hypothesized that:

> Deficits in the area of perception will ultimately affect the learning process and the behavioral characteristics of the individuals. It was also hypothesized that early detection of these deficiencies afford the greatest opportunity to retain the child in a normal learning environment.[30]

Thirty students, already in special classes (kindergarten through grade six), were referred by their teacher or the district psychologist for screening. Of these, twenty-six were selected. Children with physiological visual impairment which was incorrectable with lenses were not included. I.Q. and sex as correlates were also statistically found to be insignificant. Visual perceptual activities were in two general areas: 1) perceptual learning procedures currently used by education, psychology, and optometry in developing visual perceptual skills, and 2) specifically prescribed visual development procedures based upon each child's optometric evaluation.[31]

The authors stated that the results of this initial study were "encouraging and tended to support the basis hypothesis and confirm some progress."[32] The results for the group, however, were not statistically significant, and it was noted that particularly the upper elementary children did not make the kind of gains hoped for. It was felt that by that age the subjects had developed other problems related to the perceptual dysfunctions (repeated failure, poor self-image, behavior problems). A second study was then

[30] Ann H. Breckauer and Jay D. Mack, "A Visual-Perceptual Training Program," Academy Therapy 11 (number 3, Spring 1976): 322.

[31] Ibid., p. 324. [32] Ibid., p. 324

undertaken, using candidates from kindergarten through third grade in an attempt to see if the program would produce significant results statistically. Age performance on both visual-perception and achievement tests resulted in scores that indicated levels of perceptual ability and determined the child's admission to the program. Tests used as posttests were the Spache Diagnostic Reading Scales and the Wide Range Achievement Test. Total time for child involvement in the program averaged twenty-eight hours. From 1974-1975 150 children with learning difficulty were admitted to the program. Statistical analysis showed the group of children not functioning at grade level, 71.4% were able to function at grade level when dismissed. Finally,

> To evaluate the ongoing effect of the program, a small random sample of 24 children who had been dismissed from the program one year previously was evaluated. Their responses on the Spache Diagnostic Reading Scales and WRAT indicated that 15 were at grade level, six above grade level, and three were below grade level. 87½% were thus continuing to be successful in coping with the basic learning demands of the school system.[33]

Again, for this review of research, it is essential to point out that significant success was noted using children of academic levels kindergarten through grade three and those labeled as learning problems. Directions in further research must see these norms established, as it has appeared that these are significant factors in causing correlational significance. It has been noted by this researcher that in section reported next these two factors will again have a significant effect.

Research Denying a Correlation Between Visual Perception and Reading Abilities

Research presented in the previous section has noted a positive correlation between visual-perceptual organization and reading ability. This

[33]Ann H. Breslauer and Jay D. Mack, "A Visual-Perceptual Training Program," Academic Therapy 11 (number 3, Spring 1976): 329.

section covers those studies reported in the last five years that have denied a correlation. Fourteen studies met the criteria of this research to be presented here. Of those scholars who deny a correlation, some have seen the relationship in the other direction, i.e., that as a child learns to read he develops adequate visual-perceptual organization. Another group of scholars denying a relationship have merely stated that reading abilities and visual perceptual skills are two distinct and independent variables which have significant correlation or effect on the other, or, if there is a correlation, it is statistically too weak to warrant the development of visual-perceptual training programs as part of the curriculum for elementary schools. The following studies have been selected by this author as those meeting the criteria of this research.

A study done by Camp was developed to check the relation between specific perceptual test scores and learning rate. He hypothesized that, if there is a correlation between visual-perceptual abilities and reading, then those with visual-perceptual deficits would be poor readers.

The subjects were sixty-nine children ages 9-13 who were referred because of a reading level below 3.01 (at least two years below grade level). The Strauss and Rudnick Test Battery of Visual Perception was administered. It was predicted by Camp that those with poor visual-perceptual abilities would respond as well as those without visual-perceptual deficits to a remedial reading program, thereby denying the necessity of visual-perceptual abilities as a prerequisite to reading development. Statistical analysis showed:

> A high test-retest correlation and significant inter-test correlations but no relationship between psychometric measures and learning

> rate or achievement in the tutoring program. Thus, despite clear evidence of abnormally low scores on tests of visual-perceptual functioning and auditory visual integration, these scores were not correlated with learning rate. This finding supports the contention that the presence of perceptual handicaps does not predict response to learning in a remedial program.[34]

Again, for the purposes of this study it has been found that Camp used subjects of ages 9-13. The hypothesis proposed by this author and reiterated in the section of this study on the cognitive-developmental theory of visual perception is that, if age is a factor and if a child does compensate and learn differently and slower if he is not trained in visual-perceptual skills, then Camp's study is not valid because it has been contaminated by the compensation factor inherent in older subject methods of learning. Since it has not been possible to measure compensation factors in older subjects, this study must merely reiterate that a pattern has begun to develop in the research reviewed here which has tended to see age as a significant factor in whether or not visual-perceptual abilities are necessary for reading skills development.

A similar study was reported by Kaufman et al. The study sought to confirm or deny the hypothesis that children who make persistent visual-spatial errors after age will be poor readers, and conversely children who are not spatially disoriented will not have learning problems. This study has been included in the study because visual-spatial organization is a measurable part of visual perception on the Developmental Test of Visual Perception.

Over a six-year period, a comprehensive test battery was employed to determine the extent of reversal errors made by children beyond the age of

[34]Bonnie W. Camp, "Psychometric Tests and Learning in Severely Disabled Readers," Journal of Learning Disabilities 6 (number 8, October 1973): 57.

seven. While all tests were attempting to reveal the same deficit, namely spatial disorientation, some were also testing visual recall and/or visual-motor coordination, and some had a memory component. The authors stated that:

> The importance of establishing the presence of spatial problems depends on whether or not this deficit is linked to poor reading. A plan thus evolved to: 1) use a battery of tests to identify children with spatial problems, 2) learn whether or not a high composite score on this battery would correlate with an academic disability.[35]

The subjects were non-retarded exceptional education children. Only fifteen subjects were used in this study. The authors reported after statistical analysis that:

> No correlation was found between the percentage of spatial errors and the child's reading grade. These results do not support the stated hypotheses, and we would, therefore, question the validity of the belief that spatially disoriented children will be poor readers.[36]

This author must again point out two facts which have produced doubt as to the aforementioned study's validity. First, again the subjects' chronological ages were seven and above, while those studies reported previously affirming with correlation between visual-perceptual deficits and reading say ages 4-6 as the most beneficial stage of cognitive development. Hence this author must once again question whether compensation has begun with the subjects used in this study. Secondly, the N was only 15. This author has questioned whether the results are valid with such a small sample population.

Hammill et al developed a study to check if the supplementation of an educational program with doses of Frostig visual-perceptual program will

[35]Helen S. Kaufman and Phyllis L. Brien, "Persistent Reversers: Poor Readers, Writers, Spellers?" Academic Therapy 12 (number 2, Winter 76-77): 210.

[36]Ibid., pp. 212-213.

improve the reading skills of children. Hammill used 170 pupils in eighteen kindergarten and first-grade classes chosen from 570 pupils. These students were randomly assigned to experimental or control groups. In addition to Frostig's DTVP, the Slossen Intelligence Test, the Metropolitan Readiness Tests, and the Metropolitan Achievement Tests were administered to the subjects at the beginning of the study. In addition to the DTVP, the Philadelphia Readiness Test and the Philadelphia Reading and Arithmetic Tests were used as posttest measures. At the time of the pretest, differences between treatment groups were not statistically significant on chronological age, intelligence, perception, or achievement variables.

Training sessions covered sixteen weeks. On the average each child completed 186 Frostig worksheets. Training was done at random with no definite time allotment for the visual-perceptual training. Some teachers provided daily lessons while others provided training on an alternate-day basis. No training was done for the teachers prior to the onset of the program. The results indicated that:

> Analysis indicated that subjects who completed the most exercises earned higher perceptual scores than those who did fewest. Therefore, the performance of twenty-three pupils who had completed 200 or more worksheets was analyzed. Differences between this group and the control group on the pretest measures were not significant. The posttest analysis yielded no significant t ratios associated with readiness or achievement measures, but did yield a significant t on the total score of the DTVP...The pupils who were trained in visual perception scored no higher than their controls on the academic or readiness tests. Therefore, the use of this program as a supplement to traditional readiness activities or as a method for facilitating the mastery of reading and arithmetic does not appear to be warranted.[37]

[37]Donald Hammill, Libby Goodman, and J. Lee Wiederholt, "Visual-Motor Processes: Can We Train Them?", Reading Teacher 27 (Fall 74): 472-473.

This study has concluded that visual-perceptual training is of little value for developing reading and math abilities. While the Frostig program did train visual-perceptual abilities, these abilities did little to increase academic achievement. This writer, however, has felt the need to comment on the aforementioned study. It has been pointed out that no set time for program training was done with the control group; yet the results of the study indicate that the more work done the better the results. Secondly, there was no program of training for the directors of the visual-perceptual training programs. Yet aforementioned articles which affirmed a positive correlation between visual-perceptual training and reading abilities had pointed out the need for trained personnel to moderate the program. While the study just presented has statistically denied the correlation and statistical significance of visual-perceptual training to reading abilities, the methodology of the training program has cast serious doubts on the results.

A similar study was done by Hammill and investigated "1) the relationship between visual perception and reading comprehension, and 2) determining the effects of visual perceptual training on reading and visual perception."[38] For the purposes of this study Hammill defined visual perception as "those brain operations which involve interpreting the physical elements of the stimulus rather than the symbolic aspects of the stimulus and are usually referred to as visual discriminations and/or spatial relationships."[39] This definition may have excluded the adaptive and recall elements of visual

[38]Donald Hammill, "Training Visual Perceptual Processes," Journal of Learning Disabilities 5 (number 10, November 1972): 552.

[39]Ibid., p. 552.

perception. It has not been clarified by the author, but it should be noted that definitional aspects may have affected the outcome of the research reported below.

Hammill surveyed the correlational studies which focused on the relationship of visual perception to reading. Criteria were developed to reduce the number of articles to critique and to maximize the probability of identifying the better studies. The criteria were:

> 1) Only post-1955 reports were selected, 2) tests of reading comprehension, rather than word call or word recognition ability, had to be used, 3) the visual perceptual tasks had to satisfy the previously stated definition, 4) only studies with applied statistical analysis were chosen, 5) only research using first or second-grade subjects was suitable, for in theory older pupils with perceptual inadequacy could have compensated for their deficits.[40]

Forty-two studies which dealt with the relationship of visual perception to reading were located, of which twelve satisfied the criteria. Of the twelve, eight of the studies reported no statistically significant relationship, or coefficients too low to have predictive usefulness. Hammill stated at the conclusion of his study that:

> The cumulative results of the correlational and intervention studies apparently support strongly the proposition that reading comprehension and visual perception, as measured and as trained, are relatively unrelated abilities. Even though the correlation coefficients between the two are often statistically significant, they are generally of a very low magnitude.[41]

This author has included this study to give historical perspective to the present endeavor. Again it has been deemed necessary to question Hammill's

[40]Donald Hammill, "Training Visual Perceptual Processes," Journal of Learning Disabilities 5 (number 10, November 1972): 554.

[41]Ibid., p. 556.

methodology. Hammill chose to use only tests which measured the effect of visual-perceptual training on reading comprehension and excluded studies of letter recognition and word recognition. Letter comprehension includes many other factors and variables which may have affected the studies presented. Secondly, while comprehension is the desirable output of reading, it presupposes many lower-level abilities, among which are word and letter recognition and discrimination, which are necessary for comprehension. In terms of task analysis, it seems that word and letter recognition are more linked to visual perception than comprehension and hence would be more correlated to programs which train visual-perceptual processes.

Another study done by Hammill et al tested the use of the Frostig DTVP with economically disadvantaged children. The purpose of the investigation was to "study the appropriateness of the DTVP with a random sample of economically disadvantaged, predominately Negro children from a large eastern city."[42]

In addition to the DTVP, several other measures were administered for the purpose of measuring validity: the Slossen Intelligence Test, the Metropolitan Readiness Tests and the Metropolitan Achievement Tests. Frostig's manual was used as model for the study. Statistical analysis used split-half reliabilities with application of the Spearman-Brown correction formula. Test-retest reliability coefficients were calculated on a sample of forty-one subjects randomly selected from the total sample. Concerning results and reliability of a test, Hammill stated, "If one intends to use a particular

[42]Donald Hammill, Libby Goodman, and J. Lee Wiederholt, "Use of the Frostig DTVP with Economically Disadvantaged Children," Journal of School Psychology 9 (number 4, 1971): 431.

test as the basis for planning remedial programs for individual children, that test must possess a high reliability. If it does not, many children may either be misdiagnosed or overlooked. Reliability coefficients of .80 or above are traditionally accepted as adequate for diagnostic purposes."[43] Using this criteria to evaluate the DTVP, Hammill states further, "We must conclude that the DTVP subtests do not have sufficient temporal reliability... The total test reliabilities are acceptable, though the test-retest value associated with the kindergarten subjects is slightly below the criterion level."[44]

Hammill's study concluded then that test-retest reliability was insufficient to warrant use of the DTVP subtests as diagnostic instruments. He conceded, however, that the total test was found to be statistically reliable. This, of course, conflicts with the reliability analysis done by Frostig. Finally, this study has added another dimension to this review, for another facet of research concerning visual-perceptual training and reading achievement has now come to the surface. That is that some doubt must be given to the reliability of the DTVP to measure diagnostically the purported five aspects of the DTVP.

Hammill and Larson did a similar correlational study which reviewed the research exploring the relationship of visual discrimination, spatial relationships, memory, and auditory-visual integration to school learning. The review focused upon studies which used correlational statistical procedures and which dealt with the relationship of measures of academic achievement to

[43]Donald Hammill, Libby Goodman, and J. Lee Wiederholt, "Use of the Frostig DTVP with Economically Disadvantaged Children," Journal of School Psychology 9 (number 4, 1971): 433.

[44]Ibid, p. 433.

measures of the aforementioned processes. Afain Guilford's coefficient rangis were used to define validity. Hammill states that, according to the criteria of his study, "Sixty suitable studies which reported over 600 individual coefficients were located. All of the studies investigated the relationship in the primary grades. Regrettably, only six of the authors attempted to control for the influence of intelligence on their coefficients."[45]

The results of the study indicate that:

> While a few of the r's suggest definite but small relationships (r's >.20 <.35), none of them exceeded .35, the Guilford criterion for useful prediction. The single highest predictor of academic achievement was that of visual discrimination with arithmetic (r=.30)... The only median correlations which exceeded .35 were the total score and four of the subtests of the DTVP with arithmetic.[46]

Hammill and Larsen conclude that the relationship of visual perception to school learning is, at best, minimal and hence does not warrant the time and expense currently devoted to visual training in the schools. While Hammill did use studies just concerning kindergarten and first-grade children, it must again be reiterated that: 1) his analysis of previous research did not deal solely with research using children with perceptual deficits. Had statistical analysis been done merely on this subgroup, the aforementioned correlation of research may have arrived at different conclusions. Secondly, as the authors so validly pointed out, there was no attempt to check for intelligence as a significant factor in the correlational analysis. It has appeared then that this study must use the results of Hammill's study only with the

[45]Stephen C. Larson and Donald D. Hammill, "The Relationship of Selected Visual-Perceptual Abilities to School Learning," The Journal of Special Education 9 (number 3, 1975): 284.

[46]Ibid., p. 286.

weight it has statistically held and must take into account the factors presented above.

A study was done by Church to check if informal or formal visual-perceptual programs were better and also if either was positively correlated to academic, particularly reading, achievement. The sample was ninety children from diverse socio-economic backgrounds. Teachers taught both groups on alternating turns to avoid teacher bias. The method was to administer the Frostig DTVP as a pretest; then the children were randomly assigned to two groups. One group used the Frostig workbook, while the second group used an informal visual-perception and perceptual-motor development program. The program included visual motor, figure ground, perceptual constancy, and position in space activities. Finally, after six months of daily work for one-half hour the children were readministered the DTVP, as well as the Metropolitan Achievement Test and the Scott Forseman Basic Reading Test. The results showed that both groups gained on the Frostig DTVP but that neither gain was significant. The achievement and reading scores, when compared, did not show a significant difference between the two experimental groups. Finally, actual reading gains were not significant at the .05 level of confidence. The results of the study indicated that "a formal program of training in visual perception was not superior to an informal program either in producing better results on a visual-perceptual measure or on a reading achievement test."[47] It also intended to check if either perceptual

[47] Marilyn Church, "Does Visual Perception Training Help Beginning Readers?" Reading Teacher 27 (January 1974): 364.

development program would be statistically significant in reading achievement. However, this study neglected to pretest achievement and reading levels. The study also neglected to check statistically for an influence of I.Q., age, and sex. This study was chosen in spite of its questionable statistical analysis because it is one of the studies cited by those denying the correlation between visual-perceptual training and reading achievement; hence the need arose to have mentioned the study in this review.

Another study, done by Backland and Balow, sought to find out whether or not visual-perceptual training materials, intended to be both corrective and preventative, "are indeed so when applied to first-grade children predicted to have difficulty in learning to read."[48] The authors state that:

> This study was undertaken to determine what influence, if any, the visual perceptual training materials developed by Frostig would have on low-achieving first-grade pupils' readiness and word-recognition skills... Answers to two questions were sought:
> 1) Will low-readiness pupils trained in visual-perceptual tasks score higher on perceptual, readiness, and word-recognition tests than pupils who have not had visual-perceptual training?
> 2) Will initial perceptual skill level differentially affect pupil gain in perceptual skill, reading readiness, or word recognition?[49]

The subjects were eighty-eight experimental and seventy-eight control subjects chosen randomly from first graders. The experimental group was chosen by basis of a C or below on the Metropolitan Reading Test. All children were also tested by the Marianne Frostig Developmental Test of Visual Perception. The experimental group worked with a workbook derived from the Frostig Program for the Development of Visual Perception. A total of 125

[48]Pearl Buckland and Bruce Balow, "Effect of Visual Perceptual Training on Reading Achievement," Exceptional Children 39 (1972-73): 299.

[49]Ibid., p. 299.

pages were chosen for the booklets with twenty-five pages from each of the five sections of the Frostig Program.

The control group children listened to and discussed with the teacher stories each child heard through a headset connected to a tape recorder. The listening experience was given to the control group to insure that the control group received equal time and attention from the teacher. The program lasted for fifteen minutes a day for forty days. Then both groups were retested with different forms of the same tests used in pretesting.

The authors stated concerning the results:

> Before the children were exposed to visual-perception worksheets or to taped stories, the two groups were equal in reading readiness and in perceptual ability, as determined by an unweighted means analysis of variance. After the two groups of children in each of the classrooms were exposed to the visual-perceptual worksheets or to the taped stories, their achievement was again compared. There was no significant difference between experimental and control groups in perceptual, readiness, or word-recognition skills following the two-month treatment period. Low-readiness pupils did not profit from visual-perceptual materials any more than from listening to and discussing stories.[50]

A few comments must be made concerning Buckland and Balow's study. Of essential importance again are those aspects of the study which do not share similarity with those studies which affirmed a high correlation. Primarily, one cannot help notice that the authors had only ten hours of treatment time total in the study. Secondly, none of the teachers who worked with the experimental group had any previous training. It appears then that while this study has purported to refine a correlation between visual-perceptual abilities and reading achievement, it has neglected to use some of the

[50]Pearl Buckland and Bruce Balow, "Effect of Visual Perceptual Training on Reading Achievement," Exceptional Children 39 (1972-73): 299.

controls in its study which are called for by those affirming a correlation. Hence, for the purposes of this study, we are still between the black and white of affirmation and negation of a correlation and rather are in the grey area of what aspects of a study seem to be affecting its outcome.

A study done by Sullivan sought to discern the effects of Kephart's perceptual-motor training procedures upon a reading clinic sample, some of whom were visually handicapped with binocular fusion difficulties. Specifically, according to the author, "The purpose of this study was to determine the effects of Kephart's perceptual-motor training exercises upon the reading performance of 82 poor readers from a clinic population with average and above-average intelligence, in school grades from grade 4-12. Second, it compares the effectiveness of training upon the reading performance of children with binocular fusion difficulties and children with no apparent visual defects."[51]

A total of 113 pupils were selected from 130 applicants to attend the summer reading program. All pupils received two hours of reading instruction daily. They were placed into small homogeneous groups for reading instruction, based upon grade, age, I.Q., and reading performance. Half of the students were the experimental subjects, the remaining half the control subjects. Experimental subjects were given perceptual-motor training in addition to receiving reading instruction. Perceptual-motor exercises were conducted for one-half hour daily by an optometrist and those he trained.

[51] Joanna Sullivan, "The Effects of Kephart's Perceptual Motor Training on a Reading Clinic Sample," Journal of Learning Disabilities 5 (number 10, November 1972): 546-547.

The results of the study support the contention stated by the author that "Perceptual-motor training, as administered, has little or no effect on the reading performance of poor readers."[52]

It was important for this study to notice that once again the ages of the subjects were from grades 4-12 levels, much higher than those studies which affirmed a positive correlation. Finally, one more observation of the Sullivan study was that "The effects of perceptual-motor training upon oral reading were close to significant ($p > .05$)."[53]

A study by Anderson and Stern saw many of the problems inherent in the past studies of visual perception and reading. They cited examples of bad statistical analysis in insufficient subjects and too short of an experimental period to document the results. They state that, "Based upon the previous research designs and findings, it is difficult to make any conclusions about the effectiveness of the Frostig program when used with children for whom it was designed."[54]

> In this study a somewhat homogeneous group of elementary school students participated in one of three treatments: 1) the Frostig trained group, 2) the corrective reading group, and 3) the attention placebo group. The homogeneity was based upon the facts that none of the students was intellectually retarded, all possessed behaviors consistent with the construct described by the label "visual-perception problems," and all were reading significantly below expectation as judged by a comparison of their intelligence and reading test performances. The purpose of

[52]Joanna Sullivan, "The Effects of Kephart's Perceptual Motor Training on a Reading Clinic Sample," Journal of Learning Disabilities 5 (number 10, November 1972): 549.

[53]Ibid., p. 550.

[54]William F. Anderson and David Stern, "The Relative Effects of the Frostig Program, Corrective Reading Instruction, and Attention Upon the Reading Skills of Corrective Readers with Visual Perceptual Deficiencies," Journal of School Psychology 10 (number 4, 1972): 388.

this study was to test the efficacy of the three treatments upon the improvement of reading and visual-perceptual test scores.[55]

Of the 119 possible subjects for the program, 33 were choses on the basis of a three-step selection. The first step was to include only those who scored 90 or below on the DTVP. Secondly, these students were administered the Peabody Picture Vocabulary Test and had to score 90 and above. Finally, the third phase of the selection was the administration of the Slossen Oral Reading Test. A formula was used in determining the difference between the expected reading level based on the Peabody and the actual reading level based on the Slossen. Those reading three or more months below expectancy were included in the study.

The pupils included in the study were administered the Gates-MacGinite Reading Test and the Gilmore Oral Reading Test. DTVP scores were used as measures of visual-perceptual abilities. After eight weeks (forty sessions) of treatment, midtesting was conducted on all subjects. At the completion of the program (sixteen weeks) the pretest battery was readministered along with the DTVP.

In the treatment program each of the three teachers worked during each school day for sixteen weeks with subjects from all three groups to avoid teacher effect on the experiment. Sessions were 30 minutes each. Teachers were trained in the use of the Frostig program. For the sessions in the corrective reading group, the teachers prepared lesson plans for each child under the supervision of an experienced reading consultant. The attention

[55]William F. Anderson and David Stern, "The Relative Effects of the Frostig Program, Corrective Reading Instruction, and Attention Upon the Reading Skills of Corrective Readers with Visual Perceptual Deficiencies," Journal of School Psychology 10 (number 4, 1972): 388.

placebo subjects participated in games or contests instead of the visual-perceptual training or the reading program.

Analysis of the data involved the differences between treatment groups on the amount of test score change on the three pretest scores and the DTVP.

> During the first eight weeks of the program, the visual-perceptual group improved significantly more...However, for the last eight weeks and over the sixteen-week span, there were no significant differences in the amount of change on the subtests or the whole test...
>
> The second major area of analysis was measures on the silent reading changes. There were no significant differences between the three treatment groups on the amount of test score change from premid, midtest, or posttest testing on the vocabulary, comprehension, and accuracy subtests.
>
> The last analysis involved the comparisons of the three subtests of the Gilmore Oral Reading Test. Four of the six subjects had such few errors that statistical analysis was not possible. (On the other two subtests) during the sixteen weeks of the study the visual perceptual and corrective reading groups improved significantly relative to the attention-placebo group. The difference between the two experimental groups was not significant.[56]

The authors concluded that on the basis of their study there is little, if any, support for the use of the Frostig program on corrective reading as treatment to improve the reading skills of children considered to possess a visual-perceptual problem. For the purpose of this review of literature, this writer must add that no mention was made as to what type of remedial work was done with the corrective reading group or with the attention-placebo group. If the games used in the placebo group taught visual-perceptual abilities or if the remedial group had been process taught, this could have colored the results. This author must also add that the Anderson

[56]William F. Anderson and David Stern, "The Relative Effects of the Frostig Program, Corrective Reading Instructions, and Attention Upon the Reading Skills of Corrective Readers with Visual Perceptual Deficiencies," Journal of School Psychology 10 (number 4, 1972): 392.

and Sterns study is the closest study to those affirming a relationship between visual-perceptual abilities and reading which denies such a correlation.

Two studies used separate aspects of visual perception as a basis for their studies. While these studies do not encompass the totality of visual-perceptual abilities, this author has included them as part of the inherent working definition which was proposed previously in this review.

Santa's study was undertaken to study word perception and discrimination. The goal of the investigation was to attempt clarification of two issues: "1) what type of visual discrimination best facilitates word learning, and 2) what are the implications for the units of word recognition?"[57]

Thirty kindergarten children were selected from an urban public school through a stratified random sampling, using intelligence as a variable. The Slossen Intelligence Scale for Children was administered, and I.Q. was found not to be a significant factor. Children who could read were omitted from the study as well as those with I.Q.'s less than 90. The three training groups received different kinds of visual discrimination training:

> The word-training group received discrimination training on reading words, the letter-training condition had training on just letters, and the control group had practice discriminating geometric forms. Except for the different stimuli used in training, the training procedures and word-learning tasks for each group were identical.[58]

A word recognition task was given to the subject immediately following training. The materials were three words /pig, dig, big/ printed on cards. First pictures depicting the words were presented, then the cards.

[57]Carol M. Santa, "Visual Discrimination and Word Recognition," Reading Improvement 12 (1975): 246-247.

[58]Ibid., p. 247.

The results of the study showed that "An analysis of variance of the number of correct training responses showed a significant effect of training condition ($p < .01$) with subjects having word training making significantly more errors than either the control or the letter groups."[59] The analysis of variance of word recognition data revealed that the main effects of both training conditions and trials were not significant for any of the three groups. In other words, the subjects having letter training did no better than the control group in learning the words. While statistically this study is sound, for the purposes of this research it must be mentioned that the treatment period for this test is extremely short and hence may not have been sufficient to establish correlational analysis.

Finally, Vellutino and Steger studied recall time and visual memory factors in poor readers. As has previously been stated, both of these characteristics are part of the operational definition of visual perception. Their investigation was designed to evaluate further the studies dealing with the memory component in poor and good readers. Since other studies used immediate recall as a factor, the authors chose to employ the memory factor over an extended period.

> Poor and normal readers, selected from the second, fourth, and sixth grades, were presented with randomly arranged Hebrew letters immediately after presentation, twenty-four hours later, and six months later... The performance of these groups (good and poor readers) was compared with that of normal readers familiar with Hebrew letters. It was predicted that the non-Hebrew groups would be equivalent in short and long-term

[59]Carol M. Santa, "Visual Discrimination and Word Recognition," Reading Improvement 12 (1975): 248.

recognition, but both were expected to be less able on the memory tasks than the children learning Hebrew.[60]

The sample was stratified on three facets: grade level, reading skill, and knowledge of Hebrew. Subjects were selected at random from each grade, and there were nine subgroups with fourteen subjects in each subgroup. All children were screened for physiological or neurological disorder, as well as emotional difficulties. Subjects were asked to recall three Hebrew letters from a chart of Hebrew letters immediately after presentation, twenty-four hours later, and six months later. For the purposes of this research it was interesting to note that "The differences between non-Hebrew poor and normal readers is negligible, the pattern being maintained at each grade stratification and each recall period. Analyses for all of these contrasts yielded nonsignificant F ratios ($p > .05$)."[61] This study then provides direct support for the authors contention that deficient visual memory is not a significant cause of specific reading disability.

With the presentation of this study, the section of this research presenting studies negating a correlation between visual-perceptual abilities and reading achievement is completed. Throughout the two previous sections, the affirmative and the negative correlation sections of this review, it has been mentioned often that age has appeared to play a significant role in the outcome of the studies. The following section of this review deals with a developmental theory of visual-perceptual abilities. Authors in the previous

[60]Frank R. Vellutino, et al, "Immediate and Delayed Recognition of Visual Stimuli in Poor and Normal Readers," Journal of Experimental Child Psychology 19 (1975): 225.

[61]Ibid., p. 228.

two sections have pointed out compensation as a factor in correlational analysis as children increase in chronological age and cognitive development. The ensuing research reported here has attempted an analysis of that hypothesis.

Cognitive Developmental Approach or Perceptual Deficit Hypothesis

By the literal amount of research done in the area of visual perception and reading, it has been obvious that a malfunction in visual-perceptual abilities has most often been tested as the accountable factor. Twenty-two pieces of research met this study's criteria and were included in the previous two sections of this review of literature. This dysfunction was thought to be the source of misperceptions typically observed in the reading and written language of poor readers among which reversals, inversions, and sequencing were particularly significant. While professionals in the field have tested and retested various hypothesis dealing with different aspects of visual-perceptual deficits and reading, research has been inconclusive, particularly when the chronological age of the subjects involved is beyond six or seven. Vellutino and Steger have purported a new hypothesis which, while research is slight, has proposed a developmental approach which has considered the compensation factor of subjects beyond the age of six. They state that "Recent research has suggested that perceptual difficulties may be found in poor readers at younger age levels, but that reading problems in older children are most likely associated with dysfunction in some aspect of verbal mediation."[62]

[62]Frank R. Vellutino, Joseph A. Steger, and Gillray Kandel, "Reading Disability: Age Difference and the Perceptual Deficit Hypothesis," Child Development 46 (1975): 487.

Specifically, Vellutino et al found that:

> Poor readers were far more accurate in copying words of varying length than they were in pronouncing them. The authors concluded that the perceptual inaccuracies often observed in the reading and written language of difficient readers issue primarily from dysfunction in the verbal identification of letters and words and not in perceiving their visual features.[63]

This alternate theory, which has been labeled the cognitive developmental approach, sees reading problems in older children in light of a different hypothesis. The alternate theory is that the disabled reader:

> Perceives a graphic stimulus accurately and yet mislabels it in oral encoding because of basic difficulty in associating it with verbal counterparts. Thus it may not be true that the child who calls a "b" a "d" or "was", "saw", perceives them as such, but rather that he misreads them, in spite of reliable perception, because he is unable to produce their precise auditory designations. Thus, in the examples given, apparent positional and sequential errors would be secondary to more basic associational and recall problems, and may be more accurately classified as generalization errors due to imperfect learning (compensation), rather than perceptual distortions resulting from specific neurological disorder.[64]

The hypothesis of Vellutino et al was that the difficulties encountered by disabled readers occur more significantly on the encoding rather than the decoding side of behavior. Whether these deficits occur in the storage or retrieval aspects of encoding is unclear to the authors; yet a dysfunction at the representational level is sought to be proven. Thus poor readers may be able to match or reproduce letters and words from a standard with little or no error, in which case perceptual adequacy would be a necessary conclusion. However, these same students would have a greater difficulty in encoding

[63]Frank R. Vellutino, Joseph A. Steger, and Gillray Kandel, "Reading Disability: An Investigation of the Perceptual Deficit Hypothesis," Cortex 8 (1972): 106.

[64]Vellutino et al., "An Investigation of the Perceptual Deficit Hypothesis," p. 107.

when the task more directly involves verbal learning, mediation and expression, as in oral reading.

In order to test this hypothesis, the authors decided to:

> Contrast the visual-motor and oral encoding of disabled and normal readers. A task was designed in which both groups were presented with brief exposures of non-verbal and verbal stimuli and subjects were asked to produce, graphically, each of the items from memory. The word stimuli were presented again, and subjects were then asked to read each one aloud. It was expected that the performance of poor readers would would be comparable to that of good readers on graphic representation tasks, but considerably poorer on the oral reading task.[65]

There were thirty-four subjects in each of the two groups. The poor readers were chosen from those referred by teachers to the reading specialists as low-level readers. The normal reader group was selected randomly from a pool of children judged by school personnel as making satisfactory progress in reading. Only children with an I.Q. score of 90 or above on the Wechsler Intelligence Scale for Children were included. The Gilmore Oral Reading Test and the Metropolitan Silent Reading Test were employed to assess respective oral and silent reading skills. Children two years or more below grade level on both of these instruments were selected for the poor sample. Candidates for the normal group were at or above grade reading level. The age range was from 9-15.

These subjects were tested individually with twenty stimuli being presented. The stimuli were letters and words; subjects were asked to copy the material the first time, to read it or give its name the second trial. The

[65]Frank R. Vellutino, Joseph A. Steger, and Gillray Kandel, "Reading Disability: An Investigation of the Perceptual Deficit Hypothesis," Cortex 8 (1972): 107-108.

results of the copying of configurations and their comparisons at the ($p > .05$) level showed that "poor and normal readers did not differ appreciably in the copying of the stimuli."[66] Results also showed that the poor readers copy words much better than they read them aloud. These results seemed to support the authors' contention that "poor readers are able to process visual representations as well as normals, but find it difficult to integrate and/or retrieve the verbal equivalents of such input."[67] Finally, the authors pointed out that this study was done specifically with those children who have reached a level of cognitive development which may have allowed them to compensate for their perceptual deficit. Hence subjects of chronological age 9-15 were used.

Vellutino et al did another study in which they followed the same procedure employed earlier. Subjects were presented with geometric designs, numbers, and scrambled letters in addition to English words (visual perception). For a test of verbal identification, subjects were asked to spell the word aloud, rather than write the sequence. There were twenty-one subjects in each reader group, and there were two groups each of second and sixth graders. Subjects had I.Q. of 90 or above from previous data and no evidence of neurological dysfunction. Poor and normal readers were grouped according to the results of the Gilmore Oral Reading Test. Normal readers were to be at or above grade level, sixth-grade poor readers were two or more years below grade level, and second-grade poor readers were one or more

[66]Frank R. Vellutino, Joseph A. Steger, and Gillray Kandel, "Reading Disability: An Investigation of the Perceptual Deficit Hypothesis," Cortex 8 (1972): 111.

[67]Ibid., p. 113.

years below grade level. Methodology was the same as the Vellutino study reported immediately above. Concerning the results, the authors stated:

> The resulting data are in accord with previous findings and, in addition, extend over inferences to children younger than those studied earlier. Poor readers in both second and sixth grade performed as well as normals in the immediate visual recall of geometric designs having no linguistic referents. They also demonstrated considerably greater accuracy in copying and naming letters in words than they did in pronouncing these same words. Moreover, the performances of poor readers on letter reproduction and naming closely approximated that of normal readers, but was uniformly inferior to normals in word identification and spelling. Similarly, poor readers differed from normals on the types of errors they made only in the case of oral encoding but not in graphic reproduction. These results generally support our contention that specific reading disability is not attributable to visual-spatial disorder. Instead they provide indirect evidence for the possibility that reading disability occurs because of a disorder in some aspects of verbal mediation...Finally, the performance on visual perceptual tasks of second-grade poor readers declined as the length of a word increased, but this was not true of sixth-grade poor readers, who performed as well as sixth-grade normals. The logical extension of this inference is that poor readers, during the cause of protracted exposure to words in print, learn a great deal about their visual-perceptual properties while they continue to experience difficulty in integrating their verbal and visual counterparts.[68]

Vellutino et al then have proposed a tentative hypothesis which sees the reading disability component of visual-perceptual deficits as possibly not the causative factor and have replaced it with the cognitive developmental recall and associative components. Questions should be raised concerning whether or not the Vellutino studies do test what they purport to test. Secondly, this review must point out that, while Vellutino purported to (and did) extend his hypothesis to second graders, those who affirm a positive correlation between visual perception and reading have done so with subjects of kindergarten and grade-one levels.

[68]Frank R. Vellutino, Joseph A. Steger, and Gillray Kandel, "Reading Disability: Age Difference and the Perceptual Deficit Hypothesis," Child Development 46 (1975): 492.

Finally, in a third study Vellutino attempted to finalize the hypothesis set forth in the two aforementioned studies. Secondly, those cognitive recall and associative abilities which were hypothesized as causative factors for reading disabilities have been labeled Spatial Conservation deficits. The authors have defined spatial conservation as, "Spatial conservation demands a reversible memory image, and successful performance requires the correct sequential placements of objects in space following their absolute displacement relative to one another and to the inversion of the total visual field. In other words, spatial conservation implies that the child has fully attained the ability to successfully use cognitive rather than perceptual strategies for dealing with spatial relations."[69]

The authors stated that, although early perceptual-motor experience was related to higher experience, later on a complex spatial relations task children without these experiences excelled in other ways...This has indicated that visual-perceptual training is important during the very early, formative years of development, but these experiences may not be important at later ages or essential to high achievement later.

Vellutino et al designed a study similar to the first two reported above. The objectives of the study were:

> 1) To test whether the conceptual, spatial ability of seven-year-old children is related more highly to reading than their visual perceptual ability;
> 2) To determine whether concrete operational children with low visual-perceptual skills can, nonetheless, read adequately; and
> 3) To identify important cognitive, visual-spatial abilities that are related logically to the reading process.

[69]John Kershner, "Visual-Spatial Organization and Reading: Support for a Cognitive Developmental Interpretation," Journal of Learning Disabilities 8 (number 1, January 1975): 38-39.

[70]Ibid., p. 38.

The plan of the study was to measure the perceptual and cognitive, visual-spatial abilities of children attending a regular grade-two class, to divide the children into low and high groups on the basis of these variables, and then to test the children on their reading ability. The subjects were twenty seven-year-old, grade-two children. Methodology was the same as the previous two studies. The results showed that:

> Comparisions between high and low perceptual groups on reading comprehension yielded a t value of .46 showing that the children were not different in reading when they were grouped according to their perceptual level. On the other hand, a comparison of reading scores of the same children differentiated into high and low groups on the basis of the cognitive spatial test produced a t ratio of 5.69, $p < .01$, demonstrating that high performance on the spatial conservation test did result in superior reading ability.[71]

The authors further comment that:

> The scores suggest that a combination of intact perceptual and intact cognitive abilities may result in high reading achievement. This indicates that children with both strategies available to them may have an advantage in acquiring reading skills. However, the high reading achievement found in the low perceptual and high cognitive group suggests that, where perceptual skills are lacking, cognitive strategies can compensate for this and provide the child with the cognitive-spatial competence necessary for successful reading at the age level studied.[72]

It seemed then in this study that the poorer readers in some cases would discern fine details of the perceptual field, but this could in itself be an over-reliance on the perceptual features which would in fact interfere with their ability to see and retain important spatial relationships. The poorer readers then were unable to coordinate the multiple uses, all of which are

[71] John Kershner, "Visual-Spatial Organization and reading: Support for a Cognitive Developmental Interpretation," Journal of Learning Disabilities 8 (number 1, January 1975): 41.

[72] Ibid., p. 42.

involved in oral reading on the Gilmore Oral Reading Test and the spelling aspect of this study.

Speaking finally of visual-perceptual training and what this experiment has shown, the authors state, "The findings indicate that visual-perceptual training is important during the very early, formative years of development, but these experiences may not be important at later ages or essential to high achievement later."[73]

> To further examine the hypothesis that a perceptual deficit is not the major difficulty for poor readers, the study reported here presented poor and normal third-grade readers with high-frequency low discriminability words in four varying perceptual tasks. Based on clinical and classroom experience with children, many high risk frequency words present difficulty for beginning readers and poor readers. Therefore, it was chosen to explore this hypothesis using more generalizable stimuli frequently encountered by all readers in the reading act.[74]

The subjects were twenty-four 8-10-year-old third graders. Subjects were administered the Metropolitan Achievement Test for the purposes of grouping high and low reading achievers. Subjects were given vocabulary words and asked to perform four visual-perceptual tasks. The tasks were: a) match to form, b) delayed recall, c) reproduce from memory (written), and d) reading cards in isolation. It was predicted by the authors that "Poor and normal readers would differ significantly in their ability to read the words presented in isolation (task d) but that their achievement could not differ significantly on the remaining tasks."[75]

[73]John Kershner, "Visual-Spatial Organization and Reading: Support for a Cognitive Developmental Interpretation," Journal of Learning Disabilities 8 (number 1, January 1975): 38.

[74]Richard L. Allington, Kathleen Gormley, and Sharon Truex, "Poor and Normal Readers Achievement on Visual Tasks Involving High Frequency, Low Discriminability Words," Journal of Learning Disabilities 9 (number 5, May 1976): 35.

[75]Ibid., p.

Results indicated that, as hypothesized, tasks one, two, and three showed no significant difference between the poor reading group and the normal reading group. However, task four showed the poor and normal reading groups to differ significantly at the .01 level with $t = 4.31$. It must be reiterated that task four was the predicted variable between the two groups.

While research done is at a minimum, it seems that the cognitive developmental approach hypothesized by Vellutino et al has been a significant development. Research reported is minimal, yet conclusive. Further research is definitely warranted by the ramifications inherent in Vellutino's theory.

Thus far this review has focused on the effects of visual perceptual training to academic achievement, particularly reading. This research has also noted studies dealing with the psycho-emotional effects of visual-perceptual training, both as a correlate of academic achievement, and as a separate aspect of the total person. They are included here because of the important part psycho-emotional well being plays in the development of the total child and because psycho-emotional variables certainly affect academic achievement.

Psychological Effects of Visual-Perceptual Training

In the past five years, research into the psychological effects of visual-perceptual training has been scant. Four studies have been found to review in this study. Previous to that it was non-existent. This writer has chosen to include this section and the ensuing one (Visual Perceptual Training and Its Effect on Impulsive Children), because the studies reported following have begun a new area of potential research for those working in the psycho-emotional

affective domain of children with disabilities. Putting aside the academic significance (or lack) of visual-perceptual training, this section has been undertaken to review the literature and studies dealing with the purported psycho-emotional effects of visual-perceptual training.

Two studies by Backara were found to examine this aspect of visual-perceptual training. In the initial study Backara sought to find out whether or not children with visual-perceptual disabilities do in fact display more emotional problems by way of analysis of human figure drawing. There were thirty-five subjects in each of the control and experimental groups. Both groups had at least low-average range of intelligence. One group was composed of children with apparent visual-perceptual problems, and the other was the control group. Both groups drew human figure drawings, and the experimental group was given visual-perceptual training. The author of the study chose to use a visual-perceptual program of forty one-half hour periods. Finally, both groups again drew a human figure drawing. The drawings were analyzed by the emotional indicators established by Koppitz.

The results of the study and the statistical analysis indicated that:

> The mean number of emotional indicators was computed for both groups of children along with their standard deviations. The mean number of emotional indicators made by the experimental group was 2.91; those by the control group children, 1.45. There was a significant difference between these two means ($t = 3.65$; $p < .05$; $df = .68$).[76]

Backara had stated in his rationale for the study that "The possibility exists that children with visual or visual-perceptual difficulties may display

[76] Gary H. Backara, Joel N. Zaba, and Larry M. Raskin, "Human Figure Drawings and LD Children," Academic Therapy 11 (number 2, Winter 75-76): 220.

significantly more emotional problems than children without such difficulties."[77] The results supported this assumption. Backara added that:

> It was interesting to note that the experimental children did not appear to have an excessive amount of anxiety. Rather their drawings reflected the feelings of lack of direction, lack of self-assurance, and feelings of insecurity, inadequacy and inferiority that seem to be typical of what would be expected of a child having difficulty in school.[78]

Previous research then had established more indicators of emotional involvement in children with visual-perception problems. It was a logical conclusion that forms of education remediation, such as visual-perceptual training, ma alleviate some of the stress. The second study done by Backara then sought to determine the sensitivity of human figure drawings and to measure the emotional effects of visual-perceptual training of children who have visual-perceptual problems. The human figure drawings of children were compared after receiving visual-perceptual training to those undertaken by the subjects previous to visual-perceptual training. Two groups of children with normal intelligence were used in the study. Each group had thirty-five children. The "A" group was a group of children with learning problems and symptoms of visual-perceptual problems. Group "B" was the control group who had no symptoms of visual-perceptual problems and were doing average or above work in school. Both groups of children drew human figure drawings. Then Group A received visual-perceptual therapy based on the Frostig program for forty one-half hour sessions. Both groups again drew human figure drawings. Pre- and post-therapy drawings were analyzed using the Koppitz method. The results showed that:

[77]Gary H. Backara, Joel N. Zaba, and Larry M. Raskin, "Human Figure Drawings and LD Children," Academic Therapy 11 (number 2, Winter 75-76): 218.

[78]Ibid., p. 218.

> In the initial study comparing Groups A and B for emotional indicators in children with visual-perceptual problems, the drawings pointed to the presence of feelings of inadequacy and a general sense of insecurity and helplessness. On the posttest it was found that it was the same types of anxiety which were absent in posttreatment drawings. But with the reduction of these indicators there was a slight increase of the indicators pointing to anxiety. These types of indicators were almost non-existent in the pretreatment drawings. Therefore, while most of the children felt less inadequate, less insecure, and less helpless, they seemed to feel more anxious about their academic endeavors and situation.[79]

Armentrout also studied human figure drawings and their correlation with visual-perceptual disabilities. His study investigated, "Relationships between measures of perceptual functioning and figure-drawing ability before and after a six-week program designed to improve children's academic readiness for first grade. More specifically, the purpose was to determine whether changes in perceptual functioning brought about during that period would be reflected in figure drawing."[80]

The subjects were forty-one upper-middle-class children who had just completed kindergarten and were enrolled in a supplementary six-week program to increase their readiness for first grade. Subjects had been selected because they scored relatively low on the Metropolitan Readiness Test. The subjects spent approximately thirty minutes each day during the six-week program on visual-perceptual training, activities centering around the Frostig program. The subjects were administered the Frostig DTVP at the beginning and conclusion of the training program. Each child also did human figure

[79]Gary H. Backara and Joel N. Zaba, "Psychological Effects of Visual Training," Academic Therapy 12 (number 1, Fall 76): 102.

[80]James A. Armentrout, "Effects of Perceptual Training on Children's Human Figure Drawings," The Journal of Genetic Psychology 119 (1971): 282.

drawings at the onset and conclusion of the program. All the figure drawings were scored by the Harris scales.

The results of the study showed that, on the Frostig DTVP, "The mean P.Q. score increased about eight points, a difference significant beyond .001. Thus, the average level of perceptual functioning apparently increased over the six-week period."[81] The composite drawing score also showed an increase of about three points, a gain significant at the .05 level. It appears then that improvements in perceptual functioning were accompanied by overall improvements in figure drawing ability.

Armentrout saw then that the visual-perceptual training did improve a child's ability on a human figure drawing subtest. While the Harris scales measure cognitive ability rather than emotional scales, it is still apparent that there is a correlation between an increase in cognitive development and feelings of security and adequacy. In other words, an increase in the Harris I.Q. scales would purport to alleviate the emotional overlying factors which were indicated on the Backara pretest human figure drawings.

Finally Busby and Smittle developed a study to explore the relationship of self-concept, reading disability, and visual perception. The subjects for the study were fifty randomly selected seventh graders and fifty randomly selected ninth graders. Subjects were administered the Tennessee Self-Concept Scale, Spatial Visualization Test Nos. 8 and 9, and the Stanford Achievement Tests. The twenty-four variables of the three tests were submitted to a factor analysis. Busby and Smittle sought to establish an intercorrelation between self-concept, visual perception, and reading disabilities. This was

[81]James A. Armentrout, "Effects of Perceptual Training on Children's Human Figure Drawings," The Journal of Genetic Psychology 119 (1971): 283.

not clearly supported by the data. One could question the choice of instruments used, particularly for self-concept. Secondly, this is the only study attempted as such in the last five years. Follow-up studies are warranted by even the insignificant results, which yet point to a possible correlation between at least some of the factor loadings of self-concept and visual perception.

The correlation between psycho-emotional factors and visual perception has been recent to studies in the area of effects of visual-perceptual training. The four studies presented provided inconclusive evidence, yet point in a direction which seems to correlate healthy self-concept with visual-perceptual training for those who need it. The final section of our review of literature in chapter 2 is a presentation of another new aspect of concern stemming from visual perceptual deficits. The area of concern is the effect of visual-perceptual training on impulsive children.

The Effects of Visual Perceptual Training on Impulsive Children

The impulsivity factor in children has long been an area of concern for educators and researchers. Little research, however, has been done concerning whether visual-perceptual training does have an affect on the reflection-impulsivity dimension of children. In the last five years only one such piece of research was reported. This writer has included this research in this review because it signifies a new dimension for studies in the area of visual-perceptual training.

The study, by Shapiro, sought "To determine if a visual-perception treatment would significantly increase readiness performance of impulsive

first-grade boys."[82] This was studied by measuring the conceptual tempo of children, finding a group which is impulsive, and training them in a visual-perception program to see if it improved readiness performance.

> Conceptual Tempo, also known as the reflection-impulsivity dimension, describes the response style of a child on a match-to-standard task. A child who responds quickly, without carefully evaluating his choice and tends to commit many errors, is said to have an impulsive conceptual tempo. Several studies have shown a significant relationship between reflection-impulsivity and reading behaviors. These studies have shown that reflective first-grade children made fewer word recognition errors than their impulsive counterpart...Children with impulsive conceptual tempos have experienced much difficulty on match to standard tasks. It is necessary, therefore, to discover whether an impulsive response style can be compensated for so that these children can perform adequately.[83]

The procedure was to use the Matching Familiar Figures Test to determine the subjects' conceptual tempo. Two factors, response time and number wrong, were used to establish conceptual tempo. In a sample of ninety first-grade boys, thirty-two were found to be impulsive. The subjects were administered the Gates-MacGinite Readiness Skills Test. The subjects then received visual-perceptual training twenty minutes a day for twenty days. The Gates-MacGinite was again administered to the subjects to determine posttest scores. The results showed that:

> The experimental subjects showed significant gains on the composite scores as well as on seven of the eight subtests. The results of the study indicate that an impulsive response style can be compensated for by providing these children with a sequential and systematic training program in visual perception. These results do not indicate that the treatment increased ability in skill areas. Rather it appears that the treatment affected the manner in which the children responded to the tasks.[84]

[82]Jan E. Shapiro, "The Effects of Visual Perception Training on Reading Test Performance of Impulsive First Grade Boys," Journal of Educational Research 69 (May 1976): 338.

[83]Ibid., p. 338. [84]Ibid., p. 340.

Finally, this author must again point out the need for more research in this area.

Summary

This chapter presented research correlating visual-perceptual training and abilities with reading achievement and psycho-emotional factors. Research was divided into six sections:

1) Definitional Aspects of Visual Perception
2) Research Affirming the Relationship Between Visual-Perceptual Abilities and Reading Achievement
3) Research Negating a Relationship Between Visual-Perceptual Training and Reading Achievement
4) The Cognitive Developmental Theory
5) Visual-Perceptual Training and Its Effects on Emotional Factors
6) Visual-Perceptual Training and Its Effects on the Impulsive Child.

How visual perception is defined has an effect on the outcome of the studies. While there is some agreement as to a working definition, many facets of the definition change with some of the research. Secondly, it has been found that studies define visual perception one way and test it another.

There has been a myriad of data and research affirming and negating a relationship between visual perception and reading abilities. To date, this research has been inconclusive, but certain aspects of the research have strengthened the probability of certain outcomes. Briefly, the studies previously purported that length of remediation, chronological age, and pretest

reading level affect outcomes of data. A child in kindergarten or first grade, who is behind in reading readiness and visual-perceptual abilities and who goes through an extensive visual-perceptual training program, has been shown statistically to have the best possibility for significant gains in reading achievement on the posttest.

Research into the cognitive-developmental theory was presented. While research is not sufficient to warrant definite statements, it appeared as a result of the recent research presented in this study that the cognitive developmental theorists have presented sufficient data to warrant serious consideration and further research by educators and researchers. Data have pointed to a disability in the associational-recall system, rather than in the perceptual system, particularly with subjects in second grade and beyond who have had sufficient time to compensate for perceptual lag.

Sparse research has been undertaken in the areas of psycho-emotional stability and reflexive-impulsive personalities and how they are affected by and correlated with visual-perceptual deficits and training. What was presented in this research was minimal; yet it was the summation of what was undertaken in these areas in the past years. The research pointed to a correlation between visual-perceptual training and the forementioned psychological aspects for those lacking in perceptual abilities. The ensuing chapter will provide an indepth summary and conclusions of the research presented in this chapter.

CHAPTER 3 SUMMARY AND CONCLUSIONS

This chapter has been written as summary and conclusions to what the research reviewed in this study has ascertained. It has attempted to be as succinct as possible, concerning those conclusions which can be drawn logically and statistically, and concerning that ideation which is conjecture and opinion on the part of this writer.

The presentation of literature in this research covered five areas and was presented accordingly:

1) Definition as a factor in research dealing with visual perception and reading achievement

2) Research affirming a correlation between visual-perceptual abilities and reading achievement

3) Research negating a correlation between visual-perceptual abilities and reading achievement

4) The cognitive developmental approach

5) Psycho-emotional factors and visual-perceptual training.

This summary has been developed in four parts, with sections two and three of the experimental literature being summarized together to draw comparisons with the hope of sorting out some of the data.

1. Definition As a Factor of Studies of Visual Perception and Reading Achievement

It can be concluded from this research that the way in which visual perception is defined and measured does affect the outcome of the research.

Two factors which were seen to be particularly controversial as to their inclusion in the definition of visual perception are recall and discriminability facets of the visual process. While a working definition was included in Chapter One of this paper, it was found that this definition was by no means totally agreed upon by professionals in the field.

Secondly, while the addition of different facets of the visual process into the perceptual domain did affect the outcome of research, no definitive constants could be noted by this author. Different studies adding the same aspects of the visual process to the perceptual skill domain yielded different results. Hence it has been concluded that other variables were at work in the studies, and hence the data must be deemed inconclusive. This author adds that attempts by researchers and educators to purify and clarify the definition would help greatly to clear up some of the confusion surrounding visual perception and the worth of visual-perceptual programs.

II. Research Affirming and Denying a Correlation Between Visual Perceptual Abilities and Reading Achievement

Research which studied a correlation with reading has encompassed the majority of research in the area of visual perception in the last five years and hence constituted the majority of research for this study. After screening studies for some consistency in terms of statistical analysis, and uncontaminated subjects and studies, research was presented. The results of the research point to no definite conclusion which may be statistically drawn. Certain factors, however, did point out possible issues for further research. It was noted throughout the review of literature that those studies which

showed a positive correlation between visual-perceptual training and reading achievement espoused three rather consistent variables. These studies:

1) Used subjects with a chronologocal age of 5-6 at a stage of cognitive development where the subjects would not have been able to compensate for their perceptual deficits.

2) The subjects had measured visual-perceptual deficits or were low in reading achievement.

3) The length of the visual-perceptual program was usually significantly longer than those studies which showed no correlation.

While nothing definite may be concluded, it appears that these three factors point to a possible relationship. For the teacher or clinician actively engaged in the process of remediation, these data have said that when these three factors are present chances are good, but not statistically certain, that a child would benefit from a visual-perceptual program.

Secondly, those studies which found no such correlation had a proliferation of subjects with a chronological age of seven or older, with many of the studies involving subjects of intermediate and junior high level. The results of these studies point strongly to a negation of the value of a visual-perceptual training program at these advanced levels. While research has not refined the studies to measure what takes place with cognitive development in perceptually disabled children, it is conjectured by professionals and this writer that some compensatory process is involved in their cognitive development. Again, for the educator or clinician this would refute the use of a visual-perceptual program, particularly in grades five and up; and there

has been strong contention that these programs probably would not be sufficiently helpful to warrant the time and expense for children of chronological ages seven and over.

III. The Cognitive Development Hypothesis

The Cognitive Developmental approach to perceptual deficits and reading achievement has only recently appeared in research in the educational field. Only four pieces of research were found from the past five-year period, and little or none was done previous to that.

Very succinctly, those who espouse this approach see that those children who have visual-perceptual deficits will eventually in their cognitive development compensate for these deficits. But the lag in the total visual system will still produce poor reading abilities and achievement. This lag is hypothesized to be in the associative-recall skills of the visual system. However, once again this is conjecture. What can be stated is that four studies were presented in the section of this review dealing with the cognitive developmental approach. These studies did conclude and agree that subjects with past tested visual-perceptual problems do now appear, through testing, to have compensated for their visual-perceptual deficits but still lag far behind in reading achievement scores. The authors hypothesized that this lag was in the associational dimension of the visual field.

While too little research has been accomplished to deduce correlational evidence to support the cognitive developmental hypothesis, research presented in this study is sufficiently strong to warrant further experimentation,

particularly into the source of the lag as it affects the older students who have believably compensated for their past perceptual disabilities. For the educator and clinician working with the learning disabled adolescent, future research could prove that process teaching was not wrong at that chronological age but rather that educators were purportedly teaching the wrong process. Finally, this author sees this area demanding further research because of the ramifications for the field. If proven correct, the cognitive developmental theory could aid greatly in sorting out how to approach both the confusion from the myriad of research into visual perception and the question of process teaching at the advanced academic levels.

IV. Impulsivity and Self-concept as Related to Visual Perceptual Training and Abilities

Finally, this study presented research studying the correlation of impulsivity and self-concept as related to visual-perceptual training. Again this area of study has been new to researchers. Only five studies were found to study these two aspects as they related to visual-perceptual abilities. Hence no conclusive statements can be made from statistical analysis, and whatever is hypothesized is certainly only as strong as the amount of research in the area.

However, those (this writer included) who deal with the affective domain of the child, as well as the purely intellectual, are certainly in need of methods to improve the learning disabled child's self-concept. While research in both the impulsivity study and the emotional factor studies is insufficient

to deduce correlational certitude, the direction of the research and its implications should warrant further research and study. It is this author's hope and recommendation that both the impulsivity dimension and the emotional factor analysis be given serious study as correlates of visual-perceptual training.

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